PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF	:	Frank Eidam
FOR	:	**LOCKING RING**
SERIAL NO.	:	10/699,902
FILED	:	November 3, 2003
EXAMINER	:	James R Brittain
ART UNIT	:	3677
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DO NOT ENTER: /JB/

AMENDMENT

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Responsive to the Office Action mailed April 30, 2008, Applicant amends this application as follows:

Amendments to the Claims begin on page 2.

Remarks begin on page 9.

In the claims:

In the present amendment, Applicant has amended claims 1, 9, 32, 64 and 70.

1. (Currently Amended) A closed locking ring for a device having a locking groove, wherein said locking ring includes an outer closed circumferentially continuous edge zone which slants at a first angle relative to a plane that is normal to the axis of said locking ring in a state prior to installation and slants at a second angle to said plane in an installed state and a radially inner circumferentially interrupted engagement zone which slants at a first angle relative to said plane that is normal to the axis of said locking ring in the state prior to installation and slants at a second angle to said plane in the installed state;

said first angle of said outer closed edge zone being substantially the same as said first angle of said radially inner circumferentially interrupted engagement zone in the state prior to installation and said second angle of said outer closed edge zone being different from said second angle of said radially inner circumferentially interrupted engagement zone in the installed state; ~~and,~~

said locking ring is assembled with said device and said radially inner circumferentially interrupted engagement zone is engaged with said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, and an axle;

wherein in the assembled and installed state of the locking ring, at least a portion of said radially inner circumferentially interrupted engagement zone is permanently plastically deformed at a reduced angle relative to the state prior to installation wherein said second angle of said radially inner circumferentially interrupted engagement zone relative to said plane is less than said first and said second angles of said outer closed edge zone; and,

wherein said second angle of said radially inner circumferentially interrupted engagement zone relative to said plane is less than said first angle of said radially inner circumferentially interrupted engagement zone.

2. (Canceled)

3. (Canceled)

4. (Previously Presented) The closed locking ring as defined in claim 1, wherein said second angle of said outer closed edge zone is about 0°-40° in the installed state of said locking ring with said locking groove.

5. (Previously Presented) The closed locking ring as defined in claim 1, wherein said second angle of said radially inner circumferentially interrupted engagement zone is between and about 0°-20° in the installed state of said locking ring with said locking groove.

6. (Canceled)

7. (Previously Presented) The closed locking ring as defined in claim 1, wherein said radially inner circumferentially interrupted engagement zone is axially and radially permanently plastically deformable and thereby adjusts to said locking groove; and,

said locking ring having a first inside diameter in the state prior to installation and a second inside diameter in the installed state, said first inside diameter greater than said second inside diameter.

8. (Canceled)

9. (Currently Amended) A closed locking ring for a device having a locking groove, wherein said locking ring includes an outer closed edge zone which slants at a first angle relative to a plane that is normal to the axis of said locking ring in a state prior to installation and slants at a second angle to said plane in an installed state and a radially inner circumferentially interrupted engagement zone which slants at a first angle relative to said plane that is normal to the axis of said locking ring in the state prior to installation and slants at a second angle to said plane in the installed state, said first slanting angle of said radially inner circumferentially interrupted engagement zone being about 15°-45° in the state prior to installation of said locking ring with said locking groove;

said locking ring is assembled with said device and said radially inner circumferentially interrupted engagement zone is engaged with said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, and an axle;

said locking ring having a first inside diameter in the state prior to installation and a second inside diameter in the installed state, said first inside diameter is different from said second inside diameter wherein in the installed state at least a portion of said radially inner circumferentially interrupted engagement zone is axially and radially permanently plastically deformed and thereby adjusts to said locking groove; and,

wherein in the assembled and installed state of the locking ring, at least a portion of said radially inner circumferentially interrupted engagement zone is permanently plastically deformed at a reduced angle relative to the state prior to installation wherein said second slanting angle of said radially inner circumferentially interrupted engagement zone is less than said second slanting angle of said outer closed edge zone.

10. (Canceled)

11. (Previously Presented) The closed locking ring as defined in claim 9, wherein said first slanting angle of said radially inner circumferentially interrupted engagement zone is about the same as said first slanting angle of said outer closed edge zone.

12. (Previously Presented) The closed locking ring as defined in claim 9, wherein said second slanting angle of said radially inner circumferentially interrupted engagement zone is larger than said second slanting angle of said outer closed edge zone.

Claims 13-31. (Canceled)

32. (Currently Amended) A device having a circumferentially closed locking ring fixed axially in a groove of the device, said locking ring including an outer closed circumferentially continuous edge zone which slants at an angle relative to a plane that is normal to an axis of said

locking ring and a radially inner circumferentially interrupted engagement zone which slants at an angle relative to said plane, said angle of said outer closed edge zone being substantially the same as said angle of said radially inner circumferentially interrupted engagement zone in a state prior to installation and said angle of said outer closed edge zone being different from said angle of said radially inner circumferentially interrupted engagement zone in an installed state, said device including a shaft, a shaft stub, a bore, or combinations thereof;

said locking ring is assembled with said device and said radially inner circumferentially interrupted engagement zone is engaged with said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, and an axle;

said locking ring having a first inside diameter in the state prior to installation and a second inside diameter in the installed state, said first inside diameter is different from said second inside diameter wherein in the installed state, said radially inner circumferentially interrupted engagement zone is axially and radially permanently plastically deformed and thereby adjusts to said locking groove; and,

wherein in the assembled and installed state of the locking ring, at least a portion of said radially inner circumferentially interrupted engagement zone is permanently plastically deformed at a reduced angle relative to said state prior to installation, wherein a slanting angle of said radially inner circumferentially interrupted engagement zone in said installed state is less than a slanting angle of said outer closed edge zone in said installed state and is less than a slanting angle of said radially inner circumferentially interrupted engagement zone in said state prior to installation.

33. (Canceled)

34. (Previously Presented) The device locking ring as defined in claim 32, wherein said slanting angle of said outer closed edge zone is from about 0° to about 40°.

35. (Previously Presented) The device as defined in claim 32, wherein said slanting angle of said radially inner circumferentially interrupted engagement zone is from about 0° to about 20°.

36. (Canceled)

37. (Canceled)

38. (Original) The device as defined in claim 32, wherein the diameter of the device is larger on one side of the groove than on the other side so that an abutment or shoulder having an engagement zone is created for said radially inner circumferentially interrupted engagement zone of said locking ring.

39. (Original) The device as defined in claim 32, wherein said groove is non-rectangular shaped in cross-section.

40. (Original) The device as defined in claim 32, wherein a cross-section of said groove is tapered at least partly from its opening to its base.

Claims 41-63. (Canceled)

64. (Currently Amended) A closed locking ring for a device having a locking groove, wherein said locking ring including an outer closed edge zone which slants at an angle relative to a plane that is normal to a central axis of said locking ring and a radially inner zone which slants at an angle to said plane, said angle of said outer closed edge zone changing from a first angle to a second angle during installation of said locking ring, said angle of said radially inner zone permanently changing from said first angle to a third angle during installation of said locking ring;

said locking ring is assembled with said device in said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, an axle, and a bore;

said locking ring having a first diameter before installation and a second diameter after installation, said first diameter is different from said second diameter wherein after installation said radially inner zone is axially and radially permanently plastically deformed and thereby adjusts

to said locking groove; and,

wherein said third angle of said radially inner zone is less than said second angle of said outer closed edge zone, and said third angle of said radially inner zone is less than said first angle of said radially inner zone.

65. (Canceled)

66. (Previously Presented) The closed locking ring as defined in claim 64, wherein said second angle of said outer closed edge zone is from about 0° to about 40° after installation of said locking ring with said locking groove.

67. (Previously Presented) The closed locking ring as defined in claim 64, wherein said third angle of said radially inner zone is from about 0° to about 20° after installation of said locking ring with said locking groove.

68. (Canceled)

69. (Canceled)

70. (Currently Amended) A closed locking ring for a device having a locking groove, wherein said locking ring includes, in a state prior to installation, an outer edge zone which slants from a plane perpendicular to the axis of said locking ring at a first angle towards the axis of said locking ring, and a radially inner zone which slants from a plane perpendicular to the axis of said locking ring at substantially the same said first angle towards the axis of said locking ring, said locking ring is assembled with said device in said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, an axle, and a bore;

wherein said outer edge zone or said inner zone is an engagement zone for the engagement with the locking groove, and wherein a second angle of said outer edge zone is, in an installed state of the locking ring, different from a second angle of said radially inner zone in the installed state of

the locking ring; and,

wherein, in the assembled and installed state of the locking ring, at least a portion of said outer edge zone or said inner zone slants at a permanently plastically deformed respective said second angle towards the axis of said locking ring.

REMARKS

The Office Action of April 30, 2008 has been studied in detail along with the references applied and cited by the Examiner. In response, selected claims have been amended (claims 1, 9, 32, 64, and 70). The pending claims should be read in conjunction with the accompanying arguments in support of patentability. Further examination and reconsideration of the application as amended are respectfully requested.

THE OFFICE ACTION

Claims 1, 4, 5, 7, 9, 11, 12, 32, 34, 35, 38-40, 64, 66, 67, and 70 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 4, 7, 9, 12, 32, 34, 64, 66, and 70 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerwien et al. (DE 19961709) in view of Euler (US 4364615) and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906).

Claims 38-40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerwien et al. (DE 19961709) in view of Euler (US 4364615) and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906) as applied to claim 32 above, and further in view of Perrow (US 6390925).

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Gerwien et al. (DE 19961709) in view of Euler (US 4364615) and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906) as applied to claim 9 above, and further in view of Draving (US 2275058).

Claims 5, 35 and 67 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerwien et al. (DE 19961709) in view of Euler (US 4364615) and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906) as applied to claims 1, 32, and 64 above, and further in view of McCarrick et al. (US 5713692).

Claims 3, 13, 33, and 65 were rejected under 35 U.S.C. §103(a) as being unpatentable

over Gerwien et al. (DE 10061709) in view of Euler (US 4364615) as applied to claims 1, 9, 32, and 64 above, and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906).

REJECTIONS UNDER 35 U.S.C. §112

The Examiner rejected claims 1, 4, 5, 7, 9, 11, 12, 32, 34, 35, 38-40, 64, 66, 67, and 70 under 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended independent claims 1, 9, 32, 64, and 70 to include structure and to claim the assembled state. Namely, claim 1 has been amended to recite ". . . said locking ring is assembled with said device and said radially inner circumferentially interrupted engagement zone is engaged with said locking groove wherein said device is selected from the group consisting of a shaft, a shaft stub, and an axle; . . . ". Similar amendments have been made to the other independent claims.

Applicant's amended independent claims, including an assembled and installed state, now serve notice of what structure comprises the article. Applicant submits that the remaining dependent claims, dependent on one of the above referenced independent claims, are definite.

REJECTIONS UNDER 35 U.S.C. §103(a)

The Examiner rejected claims 1, 4, 7, 9, 12, 32, 34, 64, 66, and 70 under 35 U.S.C. §103(a) as being unpatentable over Gerwien et al. (DE 19961709) in view of Euler (US 4364615) and further in view of either Bross (US 2975667) or Turbant et al. (FR 2821906).

Gerwien et al. describes a fastening device for a bearing of a spindle wherein the spring characteristic of the spring nut element required to hold and to adjust the bearing of the spindle is based on the shape and/or the elastic deformability of the spring nut element. The spring nut element fastened to the spindle produces a predetermined elastic force, so that the bearing of the spindle can be adjusted without play. According to Gerwien et al., tabs are provided to lock the inner ring-shaped disk section of the spring nut element to the spindle. These tabs are bent

elastically to engage them in the thread of the spindle, and the resulting elastic force keeps them locked in position, so that the spring nut element cannot work itself loose. Further, as shown in Figure 2, the outer ring-shaped disk section (2) and the inner ring-shaped disk section (3) form a predetermined angle with each other. This angle can be changed elastically by the application of an external force.

The locking ring of Gerwien et al. is designed to be screwed onto a thread and is elastically deformable. The elastic deformation is maintained in the installed state (column 2, line 8). The outer edge zone and a circumferentially interrupted inner engagement zone both slant, in their state prior to installation, from a plane perpendicular to the axis of the locking ring at an angle towards the axis of the locking ring. Gerwien emphasizes "elastic deformation".

In contrast, the engagement zone of the closed locking ring according to the independent claims is not elastically, but permanently plastically deformed into an angle toward the axis of the locking ring. Such a permanent plastic deformation is not possible with the ring of Gerwien et al., because the ring of Gerwien et al. is designed to maintain elasticity also in the installed state. For the ring of Gerwien et al. to be plastically deformable upon installation, it would require a different design and material.

The Examiner next cites Euler to show the use of a closed outer edge. However, similar to Gerwien et al., Euler describes a retaining ring (30) including a cone-shaped, resilient rim (32) which defines a Belleville type spring. "The invention as claimed is intended to avoid the shortcomings of prior retaining rings by providing a retaining ring having a cones-shaped resilient rim. A plurality of resilient teeth extends radially from the rim" (refer to column 1, lines 37-40, and claims 1-3). Euler describes the advantages of its retaining ring as providing a substantially continuous circumferential contact with the shaft or housing and with the bearing; "the Belleville-type spring defined by the resilient rim of the retaining ring provides an inherently high spring rate" (column 1, lines 51-56).

Independent claims 1, 9, 32, and 64, all recite wherein in the assembled and installed state the radially inner zone is permanently plastically deformed. This feature is not anticipated nor made obvious by Gerwien et al. or Euler either singly or in combination. The cited references do not contain any motivation for the skilled person to replace the elastic deformation of the engagement

zone by the claimed plastic deformation in order to achieve the above technical effect in an assembly. To the contrary, the elastic deformation is essential for the proper functioning of Gerwien et al. and Euler.

As such, Gerwien et al. and Euler do not anticipate nor make obvious, either singly or in combination, Applicant's claims as described above. Combining Gerwien et al. with Euler, and with any other of the cited references, would not result in a locking ring as recited above in the amended independent claims.

Furthermore, Turbant et al. describes a split elastic ring. The cited additional reference to Turbant et al. does not contain any motivation for the skilled person to replace the elastic deformation of the engagement zone of the two primary references with a split elastic ring recited in Turbant et al. in order to achieve the above technical effect as claimed in the present application. To the contrary, the split elastic ring teaches away from combining with the teachings of Gerwien et al. and Euler.

Additionally, Bross describes a retaining ring having 'spring' fingers wherein the ring is "stamped in a single piece from spring sheet metal". Adding the teachings of Bross to Gerwien et al. and Euler, even though not suggested, would not result in Applicant's claimed invention. The elastic deformation is essential for the proper functioning of Gerwien et al., Euler, and Bross.

In response to the comments made by the Examiner in the latest Office Action, Applicant provides the following comments. Although any material can be described as having a yield point, none of the known rings are designed to go beyond the yield point and be plastically deformed, and none of the references suggest this. It is improper to assert that all rings can be deformed beyond the yield point. In fact, there are many (if not all) rings designed for an elastic deformation.

The remaining dependent claims add further elements that distinguish from the cited references. Thus, independent claims 1, 9, 32, 64, and 70, and all claims dependent therefrom, are allowable over this record art. Applicants accordingly request reconsideration and allowance thereof.

CONCLUSION

The present amendment merely cancels claims, adopts the Examiner's suggestions, removes issues for appeal, or is some other way requires only a cursory review by the Examiner. The claims as amended do not raise any issues with regard to new matter, do not present new issues requiring further search or consideration, and/or place the application in better condition for appeal. Accordingly, the amendment should be entered and the application forwarded for issuance. Applicant's attorney can be reached at the telephone number below if any further information is needed.

Respectfully submitted,
FAY SHARPE LLP

Karl W. Hauber, Esq.
Reg. No. 52,999
1100 Superior Avenue, Seventh Floor
Cleveland, Ohio 44114-2518
216/861-5582

CERTIFICATE OF MAILING

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